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AVIATION FORECASTS FISCAL YEARS 1967 - 1977



January 1967

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FEDERAL AVIATION AGENCY

Office of Policy Development

Economics Division

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INTRODUCTION

→ This report presents forecasts of key indicators of aviation activity and of Federal Aviation Agency workload during the period fiscal years 1967-1977. The report has ^{was} been prepared to meet the planning needs of the various offices and services of FAA for data concerning future trends in aviation activity. During this period significant changes are expected in the volume of air traffic activity and in the type of equipment that will be flying our domestic and international air routes.

Although the report focuses on the period through fiscal year 1973 to provide forecasts required in the preparation of the FAA Five-Year Program, forecasts for fiscal year 1977 ^{were} have also been prepared to meet long-range planning needs. Specific numerical forecasts ^{were} have also been included for each year from 1967 to 1973 to meet shorter term, fiscal and program planning requirements. It must be recognized, however, that year-to-year fluctuations are difficult to forecast precisely. To a considerable extent, therefore, the data reflect the trend or average conditions expected during the forecast period. () ↗

AVIATION INDUSTRY TRENDS

Air Carrier Traffic

Continued high rates of growth in passenger traffic are forecast over the next ten years for both the United States domestic and international air carriers. By fiscal year 1977 the United States airlines are expected to fly a total of 266 billion revenue passenger-miles and 352 million passengers in scheduled domestic and international service. These figures compare with 76 billion revenue passenger-miles and 114 million passengers in fiscal year 1966 (see Table 1). Growth in the international market of the U.S. airlines will be slightly higher than in the domestic market. From fiscal 1966 through fiscal 1977 the international passenger-miles are expected to increase by nearly 260 percent while domestic passenger-miles will increase by about 245 percent.

Growth of the domestic air travel market has accelerated sharply in the last few years. In fiscal years 1964, 1965, and 1966 domestic passenger-miles increased 18, 15 and 22 percent, respectively, as compared to 6 percent in fiscal 1963. Scheduled passenger-miles flown by the U.S. international air carriers rose by 19, 19, and 21 percent in the fiscal years 1964, 1965, and 1966, compared to 14 percent in fiscal 1963. The major factors behind these recent high growth rates have been the favorable economic climate, e.g., high Gross National Product, high disposable income, virtually full employment, plus a declining over-all average fare structure.

This forecast assumes that these factors will continue to exert a positive influence on air carrier traffic volumes. Along with an expected healthy economic environment, the carriers will be improving the quality, comfort, and speed of their services as more jets are added to their fleets and jet service is expanded into virtually all markets.

The domestic passenger traffic forecasts presented herein are consistent with the forecasts that were prepared for the Federal Aviation Agency in connection with its recent studies and evaluation of the supersonic transport. The essential elements supporting the forecasts are a continuing high rate of growth in the economy as measured by GNP and the assumption that the passenger fare structure will continue to decline. Gross national product is forecast at an average real growth rate of 4.25 percent and average fares are forecast to decline, in real terms, between 2 and 3 percent per year. The projections for fiscal years 1967 and 1968 have been modified from these average rates to reflect such factors as the airline strike in early fiscal year 1967 as well as the expected impact of higher than average declines in the average fare levels resulting from the relatively new promotional fares.

Total domestic passenger-miles are forecast to increase by 14 and 12 percent in fiscal years 1967 and 1968 to 66.1 and 74.0 billion, respectively. The growth trend in fiscal years 1969 and 1970 is forecast at slightly more than 10 percent per year. Beginning in fiscal year 1971, the rate of growth will climb to around 12 percent per year and remain at

about that level through fiscal year 1977. These fluctuations are due mainly to changing assumptions with regard to the over-all average fare structure. The average yields have been varied in an attempt to reflect the potential for change as new, lower-operating cost aircraft are introduced into service.

The number of domestic passenger enplanements is expected to increase sharply over current levels. In fiscal year 1966, 102 million passengers were enplaned by the domestic scheduled airlines. By fiscal year 1977 this volume is expected to more than triple to nearly 320 million. The average domestic passenger trip was 567 statute miles in fiscal year 1966, up seven miles over the previous year. In fiscal year 1977 the average trip will be around 630 miles.

The U.S. international passenger traffic forecast was related to the growth in the domestic market and, therefore, reflects many of the same general underlying economic forces. An analysis of past growth trends shows that an unusually consistent relationship has existed between U.S. domestic passenger revenue and U.S. international revenue. It was assumed this will continue through the forecast period. The passenger-mile estimates also reflect a declining series of passenger-mile revenue yields which is supported by declining unit costs, more efficient aircraft, and new promotional fares. A separate trend analysis and projection of U.S. international passenger-miles support the forecast.

In fiscal year 1966, the U.S. international carriers transported nearly 12 million passengers for a total of over 18 billion passenger-miles. By fiscal year 1977, these volumes are expected to increase to about 35 million passengers and 66 billion passenger-miles. These carriers have been reporting an ever-increasing average passenger trip length from 1,292 statute miles in 1957 to about 1,600 miles in 1966. This uptrend is expected to continue and reach about 1,900 miles in fiscal year 1977.

Air Carrier Fleet

U. S. air carriers had 1,090 turbine-powered aircraft on order as of November 1966 (see Table 2). This is the highest backlog on record and compares with 766 a year ago. The large increase in orders over the last twelve months reflects the generally optimistic outlook the industry has for the years ahead as well as its current favorable profit position. Of the aircraft on order, over one-half are two- or three-engine jets and another 400 are four-engine jets (including freighters and SST's). Only 125 aircraft on order are turboprops with nearly one-half representing conversions from piston engines. Additional orders of almost all types of jet aircraft and two-engine turboprops can be expected throughout the forecast period. Table 3 shows the U.S. air carrier fleet as forecast by year and includes firm as well as anticipated additional aircraft orders. Seat-mile productivity estimates were developed for the forecast fleet and tested for reasonableness using the passenger-mile forecast. Cargo aircraft were separately identified.

The jet fleet of the U.S. air carriers is expected to more than triple by 1973 and to quadruple by 1977 - rising from 725 aircraft as of January 1, 1966, to an estimated 2,366 on January 1, 1973, and to over 2,900 by the beginning of 1977. The number of two- and three-engine jets will increase substantially throughout the forecast period - from 214 in 1966 to over 1,350 in 1973 and to nearly 1,750 by 1977. Included in these numbers are "standard" and "stretched" versions of today's models as well as "QC" configurations. By 1969 there will be more two- and three-engine jets in the fleet than any other type. Although no manufacturer has yet announced firm plans to build a two-engine "jumbo" jet, this forecast anticipates that such an aircraft will be introduced in the early 1970's and will have a capacity of at least 200 seats and will be used on high density, short-to-medium range routes.

The large four-engine "jumbo" jets are scheduled to enter service in fiscal year 1969. It was assumed these aircraft would continue to be ordered in significant numbers through 1977 for both passenger and cargo service, and that they will be used initially on the high-density, long-haul passenger routes and gradually replace the current four-engine types on these routes. However, the forecast assumes a continuing strong demand through this decade for the current four-engine jets in both standard and stretched versions.

It was assumed Concorde deliveries will begin in January 1972 and that initial U.S. SST deliveries will be in January 1975. The present reserved

delivery position list was used in assigning these aircraft to United States and foreign air carriers.

A substantial increase is forecast in the number of one- and two-engine turboprops. In 1966 there were 97 of these aircraft in airline service, 89 two-engine and 8 single-engine. Almost all of the growth to 362 aircraft in 1973 and to 453 aircraft in 1977 will be in the two-engine category. The local service carriers will account for about 90 percent of this fleet. In 1973 about half of this fleet will be made up of aircraft converted from piston to turboprop engines.

The four-engine turboprop aircraft are expected to be retired from the U. S. air carrier fleet in substantial numbers in favor of the more productive two- and three-engine jets. The same will be true for the current fleet of piston aircraft. Most of these aircraft that remain in the fleet will be used by the supplemental carriers.

Forecasts of U.S. air carrier revenue hours and revenue miles flown have been developed and are shown in Tables 4 and 5. Average utilization rates and block speeds by aircraft types by carrier group were developed based on past trends as well as the future use of the aircraft. These values were applied to the appropriate projected air carrier aircraft types. In total, both series show steady growth throughout the forecast period. The hours flown nearly double by fiscal 1977 while the miles flown increase slightly over double. The distributions by aircraft type, however, show quite different growth trends. All types of jet aircraft show substantial

gains, while all types of piston aircraft decline to almost insignificant volumes by fiscal 1977. Within the turboprop group, the gains in the one- and two-engine category are offset by declines in the four-engine category.

General Aviation Flying and Aircraft Fleet

General aviation includes all civil flying except that performed by the interstate and intrastate air carriers operating large aircraft. It embraces a multitude of diverse and growing uses of aircraft ranging from flying for the sheer enjoyment of flying and transportation of personnel and cargo by business firms in privately-owned aircraft to special uses of aircraft, such as crop dusting, power and pipeline patrol and aerial advertising.

In recent years there has been a strong uptrend in all phases of general aviation activity and the outlook for continued growth throughout the forecast period is extremely favorable. At the beginning of 1966 there were 95,442 active aircraft in the general aviation fleet. This number is expected to increase to 152,000 by 1973 and to 180,000 aircraft by 1977 (see Table 6). Each class of aircraft will increase in number but growth rates will differ significantly by aircraft type.

Single-engine aircraft, which will continue to make up the great bulk of the fleet, will rise from 81,134 at the beginning of 1966 to an estimated 124,350 by 1973 and to 143,600 by 1977. Most of these gains will be in the larger four-seat models but increases will also be shown in the

two-place types. Multiengine piston aircraft are expected approximately to double during the forecast period from 11,422 in 1966 to approximately 23,000 by 1977. Rotorcraft will also experience significant gains rising to about 4,000 by 1977 but this number will still represent only about 2 percent of the total general aviation fleet.

Of special interest is the sharp rise anticipated in turbine-powered general aviation aircraft. At the beginning of 1966 there were only 574 in the active fleet and estimates place their current number at approximately 1,000. The forecast calls for 4,750 by 1973 and approximately 8,000 by 1977. Most of these will be powered by turboprop engines but a considerable number of pure jets is also expected. Conversion of existing piston aircraft to turbine power should account for part of the anticipated growth. Business flying and air taxi operations represent the primary markets for turbine-powered aircraft.

Total hours flown in general aviation are expected to increase from an estimated 17.5 million hours in fiscal year 1966 to 29.0 million hours in fiscal year 1973 and to 35.0 million by fiscal year 1977, or a doubling during the forecast period. Business flying will remain the largest type of general aviation flying and is forecast to account for 10.4 million hours in fiscal year 1977, or approximately 30 percent of the total, as against 6.1 million hours in fiscal year 1966. Both scheduled and non-scheduled air taxi operations will continue to show marked gains and are expected to become an increasingly important part of the nation's

air transportation system in the years ahead. Air taxis will fill a void in air service to small communities which do not generate sufficient traffic to warrant scheduled air carrier service with large transport-type aircraft. At the same time there will be an increasing demand for air taxi connecting services in major metropolitan areas between air carrier airports and outlying communities. Personal and instructional flying are expected to show higher than average growth rates, stimulated by learn-to-fly programs, rising per capita incomes and an increasing desire for travel.

Table 7 provides a regional distribution of active general aviation aircraft. There will be significant increases in the number of aircraft in all FAA Regions with the highest growth experienced in the Western and Southern Regions.

Domestic Aviation Fuel Consumption

Compared to fiscal year 1966, total fuel consumed in U.S. domestic civil aviation will more than double by fiscal year 1973 and triple by fiscal year 1977 (see Table 9). Jet fuel consumption will account for all of the increase as gasoline consumption is expected to decline by 21 percent from 755 million gallons in fiscal year 1966 to 595 million gallons in fiscal year 1977. Users of jet fuel will increase consumption from over 3.9 billion gallons to nearly 13.5 billion gallons between fiscal years 1966 and 1977. The air carriers consumed 98 percent of the jet fuel in fiscal year 1966 and are expected to use 97 and 96 percent in fiscal years 1973

and 1977. General aviation jet fuel consumption, while increasing over seven times by fiscal year 1977, will still account for a relatively small part of the total.

The drop in aviation gasoline consumption is due entirely to the substitution by the air carriers of turbine-powered aircraft for piston-powered aircraft. The air carriers accounted for 61 percent of the aviation gasoline in fiscal year 1966 with 464 million gallons. By fiscal year 1973 this gallonage is expected to drop to around 40 million and to 10 million gallons by fiscal year 1977. General aviation gasoline consumption will increase by 68 percent to 490 million gallons in fiscal year 1973 and by over 100 percent to 585 million by fiscal year 1977.

Civil Aircraft and Engine Production

In the last two years the production of civil aircraft in the United States has increased sharply and in fiscal year 1966 was at the highest level since the post-war years of 1946 and 1947. Table 10 shows the growth since 1962 and a forecast through fiscal year 1977. General aviation aircraft production, which has doubled since 1963, has accounted for between 98 and 99 percent of the total. Air carrier transport aircraft production at 284 in fiscal year 1966 was the highest since the beginning of the jet era in 1959.

The forecast for general aviation shows a doubling of production by fiscal year 1977 to a total of about 29,000 units. About 85 percent of

this demand will be for single-engine models, 13 percent will be for multi-engine piston models, with the remaining 2 percent for turbine-powered aircraft. The trend has been toward aircraft with larger capacity, greater speed, longer range, higher cruising altitude capability, and more electronic gear. This trend is expected to continue. The demand for turbine-powered aircraft, although significant by itself, will continue to be a relatively small portion of the total due to high initial and high hourly operating costs plus their complexity of operation compared with piston aircraft. The actual production levels as forecast in Table 10 may vary from those shown due to unpredictable cyclical fluctuations in the general business cycle.

The forecast of air carrier transport aircraft is based mainly on announced orders. Additional estimated orders have been added for those U.S. and foreign air carriers which have not announced orders and will require additional aircraft to remain competitive and keep up with the forecast traffic demand. Most of the future deliveries will be for the two- and three-engine jets although demand will continue to be strong for present day "standard" and "stretched" four-engine jet models in both passenger and cargo versions. Four-engine "jumbo" jet deliveries will begin in fiscal year 1969, and this forecast anticipates a large capacity two-engine jet will be forthcoming in the early 1970's. The U. S. SST's included in the forecast were estimated at an average production rate of three per month beginning in fiscal year 1975.

The forecast of civil aircraft engine production, as shown in Table 11, was based on the aircraft production figures shown in Table 10 and provides for necessary spares. Piston engine production is based solely on general aviation aircraft requirements, while the numbers of turbojet and turboprop engines account for air carrier requirements as well as general aviation. The relatively low level of turboprop engine production assumes a portion of general aviation aircraft as well as a portion of converted two-engine piston transports will be equipped with foreign-manufactured engines.

FAA AIR TRAFFIC ACTIVITY TRENDS

Significant increases are forecast in all measures of FAA airway activity and workload during the next five years and in the ensuing period through fiscal year 1977. The demands that will be placed on the national airspace system by air carrier and general aviation activity are expected to increase sharply while military flying will continue to decline. Tables 12 through 18 show the various measures of air traffic activity and workload at FAA terminal and en route facilities.

Aircraft Operations at Airports with FAA Traffic Control Service

Table 12 shows that total aircraft operations at airports with FAA traffic control service will rise from 41.2 million in fiscal year 1966 to an estimated 139.0 million operations in fiscal year 1977, an over-all increase of approximately 237 percent. Part of this gain will result from increasing air carrier and general aviation flying and part will result from the installation of FAA airport traffic control towers at additional airports whose traffic volumes are expected to exceed FAA tower establishment criteria during the forecast period.

Itinerant aircraft operations are forecast in Table 13 to increase from 26.0 million in fiscal year 1966 to 73.0 million by fiscal year 1977, a gain of over 180 percent. General aviation will account for 75 percent of the itinerant operations in 1977 as against 62 percent in 1966 and will more than triple during this period from 16.2 million to 54.9 million operations.

Air carrier operations remained virtually unchanged between fiscal years 1957 and 1963 when the increased seat capacities of the new, large jet aircraft and higher density seat configurations resulting from the shift to a primarily coach/economy service obviated the need to increase flight schedules despite the continuing rise in passenger traffic. However, air carrier operations began to rise in 1964-1965 and this upward trend accelerated in 1966 when they rose 9 percent, the largest year-over-year gain since 1957. Further rapid increases are anticipated to meet the needs of greatly expanded passenger and cargo traffic despite the continuing introduction into service during the forecast period of larger and larger transport aircraft, e.g., stretched jets, jumbo jets and the U.S. SST. The forecast calls for 16.9 million air carrier operations in fiscal year 1977, more than double the fiscal year 1966 total.

Military itinerant aircraft operations reached their peak in fiscal year 1958 when they totalled 3.4 million and accounted for 21 percent of total itinerant operations at FAA tower airports. Since then, they have declined steadily to 1.6 million and 6 percent of all itinerant operations in fiscal year 1966. Reflecting the over-all decline anticipated in military flying, military itinerant aircraft operations at FAA tower airports are forecast to continue to decline to 1.2 million in fiscal year 1977.

Local aircraft operations shown in Table 14 are primarily general aviation but also include a small and declining number of military operations.

Over the past four years general aviation local operations at FAA tower airports have more than doubled totalling 13.5 million in fiscal year 1966. This growth will continue and by fiscal year 1977 general aviation local operations will total an estimated 64.8 million. This rapid growth in part will result from the expansion of pleasure and instructional flying and in part will reflect the large proportion of local flying activity at the general aviation airports which qualify for FAA airport traffic control service during the forecast period.

Instrument operations at airports with FAA traffic control service, including those at FAA-operated military radar approach control facilities, totalled 11.0 million in fiscal year 1966, up from 7.4 million in fiscal year 1962 (see Table 15). The forecast calls for 26.0 million instrument operations by fiscal year 1977, well over double the 1966 level. During the forecast period, an increasing proportion of air carrier and general aviation operations will be flown under instrument flight rules (IFR).

FAA En Route Traffic Control Activity

The number of IFR aircraft handled, which is used to measure en route IFR activity and workload at FAA air route traffic control centers, is forecast in Table 16 to increase from 13.5 million in fiscal year 1966 to 30.3 million in fiscal year 1977. Air carrier aircraft handled, which account for 55 percent of the total, showed little change between 1960 and

1963. However, beginning in fiscal year 1964 a sharp uptrend developed with 1966 up 18 percent over 1965. The forecast expansion in air carrier traffic and the increasing tendency of the air carriers to fly IFR provide the basis for further strong growth and air carrier aircraft handled have been forecast to increase from 7.4 million in fiscal year 1966 to 17.8 million in fiscal year 1977.

General aviation historically has accounted for a relatively small but rising proportion of en route IFR traffic. In fiscal year 1966 general aviation aircraft handled rose to 1.7 million, representing 13 percent of the total, up 35 percent from fiscal year 1965 and approximately double the fiscal year 1962 volume. The continuing growth and upgrading of the general aviation fleet, particularly as turbine-powered and other more fully instrumented aircraft enter into service, should result in a further sharp uptrend in IFR flying by general aviation. The forecast is for approximately 9.0 million general aviation IFR aircraft handled by fiscal year 1977, a more than five-fold increase over 1966.

Military aircraft handled turned down in fiscal year 1966 totalling 4.4 million compared with 4.6 million the previous year. With total military flying expected to continue its decline, military IFR aircraft are expected to decrease gradually to 3.5 million by fiscal year 1966.

FAA Flight Services

Tables 17 and 18 show measures of workload and activity at FAA flight service stations and combined station/towers. Total flight services, which is a weighted workload measure consisting of aircraft contacted, flight plans originated, pilot briefs and flight condition messages, are forecast to increase from 29.1 million in fiscal year 1966 to 63.0 million in fiscal year 1973 and to 84.7 million in fiscal year 1977 assuming no basic change in the flight service system.

Flight plans originated, after showing unusually large increases in fiscal years 1961 and 1962 largely as a result of the transfer to FAA of the functions of the six military flight service centers in the United States, rose steadily from 1963 to 1966 with IFR flight plans rising more rapidly than VFR. By fiscal year 1977 flight plans originated are forecast to total 10.4 million compared with 4.4 million in fiscal year 1966.

Total aircraft contacted are expected to continue their strong uptrend and are forecast to increase from 8.6 million in fiscal year 1966 to 18.3 million in fiscal year 1977. IFR aircraft contacted, after declining precipitously between fiscal years 1958 and 1964, began to increase in 1965-1966. This increase promises to continue largely as a result of more IFR flying by general aviation. The forecast anticipates that IFR aircraft contacted will increase from 0.9 million in fiscal year 1966 to 2.5 million in fiscal year 1977.

Over the years VFR aircraft contacted have shown strong and steady growth, particularly with respect to general aviation aircraft which now account for approximately 88 percent of this activity. In total VFR aircraft contacted are forecast to approximately double during the forecast period to 15.8 million in fiscal year 1977.

Pilot briefs tripled between fiscal years 1962 and 1966 with 1966 increasing more than 40 percent over 1965. Continuing rapid growth is anticipated to a total of 22.8 million by fiscal year 1977 compared with 5.8 million in fiscal year 1966.

Table 1

UNITED STATES SCHEDULED AIRLINE PASSENGER TRAFFIC

Fiscal Year	Revenue Passenger Enplanements (millions)		Revenue Passenger-miles (billions)	
	Total	Domestic	International	Total
1962	66.6	59.9	6.7	42.5
1963	70.7	63.3	7.4	45.9
1964	83.0	74.4	8.6	54.2
1965	94.6	84.6	10.0	62.6
1966	113.9	102.2	11.7	76.4
1967*	128.0	114.8	13.2	87.5
1968*	142.2	127.4	14.8	98.4
1969*	153.9	138.0	15.9	107.7
1970*	168.0	150.8	17.2	118.8
1971*	186.0	167.0	19.0	133.0
1972*	206.5	185.5	21.0	149.0
1973*	230.0	207.0	23.0	167.5
1977*	352.0	317.5	34.5	266.0
*forecast.				

Table 2

TURBINE-POWERED AIRCRAFT ON ORDER BY UNITED STATES AIR CARRIERS

Aircraft Type	Aircraft Fleet 6/30/66	Additional Aircraft on Order for Delivery					Total
		1966	1967	1968	1969	1970 or Later	
Total Aircraft	1,229	239	396	246	62	147	1,090
Jet	868	181	329	246	62	55	873
2-engine: BAC-111	40	15	2	-	-	-	17
Boeing 737	-	-	3	75	11	-	89
Douglas DC-9	23	55	111	41	9	2	218
Sud Caravelle	20	-	-	-	-	-	-
3-engine: Boeing 727	228	71	102	60	13	-	246
4-engine: Boeing 707	222	27	69	29	9	4	138
Boeing 720	127	2	5	-	-	-	7
Boeing 747	-	-	-	-	16	49	65
Convair 880/990	64	-	-	-	-	-	-
Douglas DC-8	144	11	37	41	4	-	93
Turboprop	345	58	65	-	-	-	123
1-engine: Turbo Porter	8	-	-	-	-	-	-
2-engine: F-27/FH-227	66	23	33	-	-	-	56
Convair 580/600	50	25	31	-	-	-	56
Grumman Gulfstream	1	-	-	-	-	-	-
Nord 262	10	2	-	-	-	-	2
Nihon YS-11	-	3	-	-	-	-	3
Short Skyvan	-	1	-	-	-	-	1
DeHavilland Twin Otter	-	2	-	-	-	-	2
4-engine: Lockheed Electra	124	-	-	-	-	-	-
Lockheed Hercules	2	2	1	-	-	-	3
Vickers Viscount	56	-	-	-	-	-	-
A.W.650 Argosy	6	-	-	-	-	-	-
Canadair CL-44	22	-	-	-	-	-	-
Helicopters	16	-	2	-	-	-	2
1-engine: Sikorsky S-62	1	-	-	-	-	-	-
2-engine: Boeing-Vertol 107	7	-	-	-	-	-	-
Sikorsky S-61	8	-	2	-	-	-	2
Supersonic Transports	-	-	-	-	-	92	92
Concorde	-	-	-	-	-	36	36
U.S.-built	-	-	-	-	-	56	56

Note.— Included here are all turbine-powered aircraft on order by the United States certificated route, supplemental, intrastate and commercial air carriers to the extent reported by the aircraft manufacturers and air carriers through November 1966. Aircraft on option are excluded. Aircraft leased or to be delivered under a lease contract are included. Supersonic transport figures relate only to reserved delivery positions.

Table 3

TOTAL AIRCRAFT IN THE SERVICE OF UNITED STATES AIR CARRIERS

(As of January 1)

Aircraft Type	Reported 1966	Forecast									
		1967	1968	1969	1970	1971	1972	1973	1977		
<u>Total Aircraft</u>	<u>2,125</u>	<u>2,337</u>	<u>2,366</u>	<u>2,400</u>	<u>2,540</u>	<u>2,700</u>	<u>2,875</u>	<u>3,000</u>	<u>3,500</u>		
<u>Fixed-wing Aircraft</u>	<u>2,104</u>	<u>2,315</u>	<u>2,342</u>	<u>2,375</u>	<u>2,514</u>	<u>2,673</u>	<u>2,847</u>	<u>2,972</u>	<u>3,470</u>		
<u>Jet</u>	<u>725</u>	<u>1,044</u>	<u>1,366</u>	<u>1,653</u>	<u>1,857</u>	<u>2,025</u>	<u>2,194</u>	<u>2,366</u>	<u>2,923</u>		
2-and 3-engine 4-engine SST	214 511 -	454 590 -	674 692 -	900 753 -	1,035 822 -	1,138 887 -	1,252 942 -	1,361 991 14	1,746 1,091 86		
<u>Turboprop</u>	<u>312</u>	<u>396</u>	<u>462</u>	<u>394</u>	<u>382</u>	<u>386</u>	<u>402</u>	<u>409</u>	<u>488</u>		
1-and 2-engine 4-engine	97 215	183 213	282 180	318 76	333 49	339 47	353 49	362 47	453 35		
<u>Piston</u>	<u>1,067</u>	<u>875</u>	<u>514</u>	<u>328</u>	<u>275</u>	<u>262</u>	<u>251</u>	<u>197</u>	<u>59</u>		
1-and 2-engine 4-engine	620 447	478 397	260 254	170 158	163 112	160 102	155 96	117 80	26 33		
<u>Helicopter</u>	<u>21</u>	<u>22</u>	<u>24</u>	<u>25</u>	<u>26</u>	<u>27</u>	<u>28</u>	<u>28</u>	<u>30</u>		
Piston Turbine	6 15	6 16	6 18	6 19	6 20	6 21	6 22	6 22	- 30		

Note. -- Included here are all passenger and cargo aircraft owned or leased by, and in the domestic or international service of the United States certificated route, supplemental, intrastate and commercial air carriers. Aircraft used for training and aircraft that have been withdrawn from service and are awaiting disposal are not included here. Aircraft in the service of air taxi operators are shown in the general aviation aircraft fleet on another page of this report.

Table 4

TOTAL REVENUE AIRCRAFT HOURS, UNITED STATES AIR CARRIERS

(In millions)

Aircraft Type	Reported FY 1966	Forecast								
		FY 1967	FY 1968	FY 1969	FY 1970	FY 1971	FY 1972	FY 1973	FY 1977	
<u>Total Aircraft</u>	<u>4.80</u>	<u>5.27</u>	<u>5.58</u>	<u>5.82</u>	<u>6.28</u>	<u>6.73</u>	<u>7.20</u>	<u>7.64</u>	<u>9.27</u>	
<u>Fixed-wing Aircraft</u>	<u>4.78</u>	<u>5.24</u>	<u>5.55</u>	<u>5.79</u>	<u>6.25</u>	<u>6.70</u>	<u>7.17</u>	<u>7.61</u>	<u>9.23</u>	
Jet	2.33	3.06	3.93	4.68	5.23	5.69	6.14	6.63	8.18	
2-and 3-engine	0.55	1.14	1.68	2.23	2.56	2.81	3.08	3.37	4.41	
4-engine	1.78	1.92	2.25	2.45	2.67	2.88	3.06	3.21	3.50	
SST	-	-	-	-	-	-	-	0.05	0.27	
Turboprop	0.76	0.87	1.00	0.82	0.80	0.80	0.83	0.84	1.01	
1-and 2-engine	0.23	0.38	0.59	0.67	0.70	0.72	0.74	0.76	0.97	
4-engine	0.53	0.49	0.41	0.15	0.10	0.08	0.09	0.08	0.04	
Piston	1.69	1.31	0.62	0.29	0.22	0.21	0.20	0.14	0.04	
1-and 2-engine	0.97	0.69	0.26	0.09	0.08	0.08	0.08	0.06	*	
4-engine	0.72	0.62	0.36	0.20	0.14	0.13	0.12	0.08	0.04	
Helicopters	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	
Piston engine	*	*	*	*	*	*	*	*	-	
Turbine engine	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	

* Less than 0.005.

Note.— Included here are revenue hours flown by all passenger and cargo aircraft that are owned or leased by, and are in the domestic or international service of the United States certificated route, supplemental, intrastate and contract air carriers. Hours for fiscal year 1966 are partially estimated.

Table 5

TOTAL REVENUE AIRCRAFT MILES, UNITED STATES AIR CARRIERS
(In millions)

Aircraft Type	Reported	Forecast									
	FY 1966	FY 1967	FY 1968	FY 1969	FY 1970	FY 1971	FY 1972	FY 1973	FY 1977		
<u>Total Aircraft</u>	<u>1,615</u>	<u>1,857</u>	<u>2,096</u>	<u>2,244</u>	<u>2,427</u>	<u>2,599</u>	<u>2,758</u>	<u>2,934</u>	<u>3,613</u>		
<u>Fixed-wing Aircraft</u>	<u>1,613</u>	<u>1,855</u>	<u>2,093</u>	<u>2,241</u>	<u>2,424</u>	<u>2,596</u>	<u>2,755</u>	<u>2,931</u>	<u>3,609</u>		
Jet											
2-and 3-engine	233	444	627	1,985	2,191	2,367	2,522	2,709	3,380		
4-engine	854	921	1,085	1,177	1,287	1,386	1,465	1,534	1,682		
SST	-	-	-	-	-	-	-	38	254		
Turboprop	200	231	252	193	185	184	191	191	221		
1-and 2-engine	50	88	134	148	154	157	164	167	213		
4-engine	150	143	118	45	31	27	27	24	8		
Piston	326	259	129	63	48	45	42	31	8		
1-and 2-engine	166	119	45	15	14	14	14	10	2		
4-engine	160	140	84	48	34	31	28	21	6		
Helicopters	<u>2</u>	<u>2</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>4</u>		
Piston engine	*	*	*	*	*	*	*	*	-		
Turbine engine	2	2	3	3	3	3	3	3	4		

* Less than 0.5.

Note. -- Included here are revenue miles flown by all passenger and cargo aircraft owned or leased by, and in the domestic or international service of the United States certificated route, supplemental, intrastate and contract air carriers. Miles for fiscal year 1966 are partially estimated.

Table 6

ACTIVE GENERAL AVIATION AIRCRAFT BY TYPE OF AIRCRAFT

As of January 1	Total	P i s t o n		Turbine	Rotorcraft	Other
		Single-engine	Multiengine			
1962	80,632	71,010	8,211	186	798	427
1963	84,121	73,456	8,978	213	967	507
1964	85,088	73,625	9,458	245	1,171	588
1965	88,742	76,136	10,346	306	1,306	648
1966	95,442	81,134	11,422	574	1,503	809
1967*	104,000	88,000	12,500	950	1,700	850
1968*	112,000	94,000	13,600	1,550	1,900	950
1969*	120,000	100,000	14,650	2,260	2,070	1,020
1970*	128,000	106,100	15,700	2,900	2,250	1,050
1971*	136,000	112,200	16,750	3,500	2,450	1,100
1972*	144,000	118,300	17,800	4,100	2,650	1,150
1973*	152,000	124,350	18,850	4,750	2,850	1,200
1977*	180,000	143,600	23,000	8,000	4,000	1,400

*Forecast.

Table 7

ACTIVE GENERAL AVIATION AIRCRAFT BY FAA REGION

As of January 1	Total	FAA Region					
		Eastern	Southern	Southwest	Central	Western	Pacific
1962	80,632	16,849	8,687	12,044	22,759	18,697	1,449
1963	84,121	17,592	9,015	12,551	23,437	19,837	1,525
1964	85,088	17,629	9,439	12,556	23,590	20,218	1,488
1965	88,742	18,275	10,032	12,985	24,464	21,304	1,476
1966	95,442	20,159	11,110	13,964	25,741	22,661	1,600
1967*	104,000	21,700	12,300	15,100	27,800	25,000	1,790
1968*	112,000	23,000	13,600	16,100	29,700	27,400	1,870
1969*	120,000	24,400	14,800	17,200	31,600	29,700	1,940
1970*	128,000	25,500	16,100	18,300	33,400	32,100	2,210
1971*	136,000	26,900	17,500	19,200	35,200	34,400	2,390
1972*	144,000	28,100	18,900	20,300	37,000	36,700	2,520
1973*	152,000	29,600	20,200	21,200	38,600	39,100	2,790
1977*	180,000	33,800	25,700	24,000	44,500	48,200	3,200

*Forecast.

Note.—Totals include a small number of aircraft located in foreign countries.

Table 8
HOURS FLOWN IN GENERAL AVIATION
(In millions)

Fiscal Year	Total	Business	Commercial	Instructional	Personal	Other
1962	14.0	5.6	2.8	2.1	3.4	0.1
1963	14.8	5.6	3.2	2.4	3.5	0.1
1964	15.4	5.7	3.2	2.6	3.7	0.2
1965	16.2	5.8	3.3	3.0	3.9	0.2
1966**	17.5	6.1	3.5	3.4	4.3	0.2
1967*	19.0	6.5	3.8	3.8	4.7	0.2
1968*	20.5	6.8	4.1	4.2	5.2	0.2
1969*	22.1	7.2	4.5	4.5	5.7	0.2
1970*	23.7	7.6	4.9	4.8	6.2	0.2
1971*	25.4	8.0	5.3	5.2	6.7	0.2
1972*	27.2	8.4	5.7	5.6	7.3	0.2
1973*	29.0	8.8	6.0	6.0	7.9	0.3
1977*	35.0	10.4	7.2	7.4	9.7	0.3

*Forecast.

**Preliminary

Note.— Hours for 1962-1965 have been developed from calendar year data shown in FAA Statistical Handbook of Aviation.

Table 9

FUEL CONSUMED BY UNITED STATES DOMESTIC CIVIL AVIATION

(In millions of gallons)

Fiscal Year	Jet Fuel			Aviation Gasoline			Total Jet Fuel And Aviation Gasoline
	Air Carrier 1/	General Aviation 2/	Total	Air Carrier 1/	General Aviation 2/	Total	
1962	1,875	15	1,890	745	232	977	2,867
1963	2,250	25	2,275	635	245	880	3,155
1964	2,561	36	2,597	615	255	870	3,467
1965	3,058	61	3,119	557	277	834	3,953
1966	3,907	72	3,979	464	291	755	4,734
1967*	4,770	85	4,855	380	315	695	5,550
1968*	5,740	130	5,870	180	340	520	6,390
1969*	6,450	180	6,630	80	375	455	7,085
1970*	7,000	220	7,220	50	400	450	7,670
1971*	7,450	255	7,705	50	430	480	8,185
1972*	7,870	285	8,155	50	460	510	8,665
1973*	9,180	330	9,510	40	490	530	10,040
1977*	12,960	520	13,480	10	585	595	14,075

*Forecast.

1/ Partially estimated for fiscal years 1962-1966.

2/ Estimates only are shown for fiscal years 1962-1966; actual fuel consumption by general aviation aircraft is not reported.

Note.—Domestic civil aviation is defined for purposes of this table to include all civil aircraft flights which originate and terminate within the 48 states, within Hawaii and within Alaska. Fuels consumed by airframe and aircraft engine manufacturers, whether for flight testing or ground testing, are not shown here because they are not available for the domestic industry as a whole and cannot be estimated with any assurance of accuracy. Estimates of fuel consumed by the supplemental, contract and intrastate air carriers are included in the "Air Carrier" columns.

Table 10
CIVIL AIRCRAFT PRODUCTION IN THE UNITED STATES
(Number of Aircraft)

Fiscal Year	Air Carrier Transport Aircraft	General Aviation Aircraft	Total
1962	161	7,133	7,294
1963	90	7,388	7,478
1964	124	8,944	9,068
1965	189	10,861	11,050
1966	284	14,879	15,163
1967*	445	17,000	17,445
1968*	480	18,500	18,980
1969*	390	19,500	19,890
1970*	350	20,500	20,850
1971*	275	21,500	21,775
1972*	230	22,500	22,730
1973*	220	23,500	23,720
1977*	250	29,000	29,250

*Forecast.

Note.—Civil aircraft for export are included here, but military type aircraft shipped to other than United States military customers, e.g., to foreign governments, are excluded. All helicopter production, including air carrier transport helicopters, is included in the column for general aviation aircraft.

Table 11

CIVIL AIRCRAFT ENGINE PRODUCTION IN THE UNITED STATES

(Number of Engines)

Fiscal Year	Turbojet	Turboprop	Piston	Total
1962	806	9	10,540	11,355
1963	307	-	10,260	10,567
1964	540	-	12,532	13,072
1965	1,058	52	15,356	16,466
1966	1,840	149	20,407	22,396
1967*	2,100	400	23,400	25,900
1968*	2,400	500	25,300	28,200
1969*	2,050	500	26,700	29,250
1970*	1,850	500	28,100	30,450
1971*	1,550	500	29,500	31,550
1972*	1,400	550	30,900	32,850
1973*	1,350	550	32,300	34,200
1977*	1,800	1,000	39,000	41,800

*Forecast.

Note.—Civil aircraft engines for export are included here, but military type aircraft engines shipped to other than United States military customers, e.g., to foreign governments, are excluded.

Table 12

**TOTAL ITINERANT AND LOCAL AIRCRAFT OPERATIONS
AT AIRPORTS WITH FAA TRAFFIC CONTROL SERVICE**

(In millions)

Fiscal Year	Total	Itinerant	Local
1962	27.4	18.8	8.6
1963	29.2	19.7	9.5
1964	32.9	21.6	11.3
1965	35.6	22.9	12.7
1966	41.2	26.0	15.2
1967*	49.1	29.6	19.5
1968*	55.7	33.4	22.3
1969*	62.3	36.7	25.6
1970*	69.3	40.4	28.9
1971*	77.2	44.5	32.7
1972*	85.1	48.4	36.7
1973*	93.4	52.3	41.1
1977*	139.0	73.0	66.0

*Forecast.

Note.—An aircraft operation is defined as an aircraft arrival at or a departure from an airport with FAA traffic control service. A local operation is performed by an aircraft that: operates in the local traffic pattern or within sight of the tower; is known to be departing for or arriving from flight in local practice areas; or executes simulated instrument approaches or low passes at the airport. All aircraft arrivals and departures other than local (as defined above) are classified as itinerant operations.

Table 13

**ITINERANT AIRCRAFT OPERATIONS
AT AIRPORTS WITH FAA TRAFFIC CONTROL SERVICE**

(In millions)

Fiscal Year	Total	Air Carrier	General Aviation	Military
1962	18.8	7.1	9.9	1.8
1963	19.7	7.1	10.9	1.7
1964	21.6	7.4	12.4	1.8
1965	22.9	7.5	13.7	1.7
1966	26.0	8.2	16.2	1.6
1967*	29.6	8.6	19.5	1.5
1968*	33.4	9.6	22.4	1.4
1969*	36.7	10.1	25.2	1.4
1970*	40.4	10.8	28.2	1.4
1971*	44.5	11.9	31.2	1.4
1972*	48.4	12.8	34.3	1.3
1973*	52.3	13.6	37.4	1.3
1977*	73.0	16.9	54.9	1.2

*Forecast.

Note.—See Table 12 for definition of itinerant operations. The forecast increase in itinerant operations is based in part on the assumption that an average of fifteen new towers will be added each year throughout the forecast period.

Table 14

**LOCAL AIRCRAFT OPERATIONS
AT AIRPORTS WITH FAA TRAFFIC CONTROL SERVICE**

(In millions)

Fiscal Year	Total	General Aviation	Military
1962	8.6	6.6	2.0
1963	9.5	7.5	2.0
1964	11.3	9.3	2.0
1965	12.7	10.8	1.9
1966	15.2	13.5	1.7
1967*	19.5	17.8	1.7
1968*	22.3	20.7	1.6
1969*	25.5	23.9	1.6
1970*	28.9	27.4	1.5
1971*	32.7	31.2	1.5
1972*	36.7	35.3	1.4
1973*	41.1	39.7	1.4
1977*	66.0	64.8	1.2

*Forecast.

Note.— See Table 12 for definition of local operations. The forecast increase in local operations is based in part on the assumption that an average of fifteen new towers will be added each year throughout the forecast period.

Table 15

INSTRUMENT OPERATIONS AT AIRPORTS
WITH FAA TRAFFIC CONTROL SERVICE

(In millions)

Fiscal Year	Instrument Operations
1962	7.4
1963	7.8
1964	8.7
1965	9.6
1966	11.0
1967*	12.0
1968*	13.5
1969*	14.8
1970*	16.1
1971*	17.5
1972*	18.9
1973*	20.3
1977*	26.0

*Forecast.

Note.—An instrument operation is defined as the handling by an FAA terminal traffic control facility of the arrival or departure at an airport of an aircraft on an IFR flight plan or the provision of IFR separation to other aircraft by an FAA terminal traffic control facility.

Includes instrument operations at FAA-operated military radar approach control facilities.

Table 16

AIRCRAFT HANDLED, IFR DEPARTURES, AND OVERS BY USER CATEGORY
FAA AIR ROUTE TRAFFIC CONTROL CENTERS

(In millions)

Fiscal Year	Total			Air Carrier			General Aviation			Military		
	Aircraft Handled	IFR Departures	Overs	Aircraft Handled	IFR Departures	Overs	Aircraft Handled	IFR Departures	Overs	Aircraft Handled	IFR Departures	Overs
1962	10.1	3.6	2.9	5.5	2.1	1.2	.9	.4	.1	3.7	1.1	1.6
1963	10.2	3.6	2.9	5.3	2.1	1.2	.9	.4	.2	3.9	1.2	1.6
1964	11.1	4.0	3.1	5.7	2.2	1.2	1.0	.4	.2	4.4	1.4	1.7
1965	12.2	4.6	3.0	6.3	2.5	1.3	1.3	.6	.2	4.6	1.5	1.6
1966	13.5	5.2	3.1	7.4	3.0	1.5	1.7	.7	.2	4.4	1.5	1.4
1967*	14.9	5.8	3.3	8.5	3.4	1.7	2.3	1.0	.3	4.1	1.4	1.3
1968*	16.5	6.5	3.5	9.7	3.9	1.9	2.8	1.2	.4	4.0	1.4	1.2
1969*	17.9	7.1	3.7	10.5	4.2	2.1	3.4	1.5	.4	4.0	1.4	1.2
1970*	19.1	7.6	3.9	11.1	4.4	2.3	4.0	1.8	.4	4.0	1.4	1.2
1971*	21.3	8.5	4.3	12.6	5.0	2.6	4.7	2.1	.5	4.0	1.4	1.2
1972*	22.4	9.0	4.4	13.3	5.3	2.7	5.3	2.4	.5	3.8	1.3	1.2
1973*	24.1	9.7	4.7	14.3	5.7	2.9	6.0	2.7	.6	3.8	1.3	1.2
1977*	30.3	12.4	5.5	17.8	7.1	3.6	9.0	4.1	.8	3.5	1.2	1.1

*Forecast.

Note.—Detail may not add to total due to independent rounding. The aircraft handled count consists of the number of IFR departures multiplied by two plus the number of overs. This concept recognizes that for each departure there is a landing. An IFR departure is defined as an original IFR flight plan filed either prior to departure or after becoming airborne. An over flight originates outside the ARTC area and passes through the area without landing.

Table 17

**FLIGHT SERVICES, PILOT BRIEFS, FLIGHT CONDITION MESSAGES
AND FLIGHT PLANS ORIGINATED
FAA FLIGHT SERVICE STATIONS AND COMBINED STATION/TOWERS**

(In millions)

Fiscal Year	Flight Services	Pilot Briefs And Flight Condition Messages	Flight Plans Originated		
			Total	IFR-DVFR	VFR
1962	17.8	1.9	3.5	1.7	1.8
1963	19.3	2.4	3.6	1.7	1.9
1964	21.4	2.9	3.9	2.0	1.9
1965	24.5	4.1	4.1	2.1	2.0
1966	29.1	5.8	4.4	2.3	2.1
1967*	34.1	7.6	4.8	2.5	2.3
1968*	38.6	9.1	5.2	2.7	2.5
1969*	43.2	10.6	5.7	3.0	2.7
1970*	48.2	12.2	6.2	3.2	3.0
1971*	53.0	13.7	6.7	3.5	3.2
1972*	57.9	15.2	7.2	3.7	3.5
1973*	63.0	16.7	7.8	4.1	3.7
1977*	84.7	22.8	10.4	5.4	5.0

*Forecast.

Note.—Flight Services is a weighted workload measurement used in Airway Planning Standard No. 5 (the ATS Staffing Standard). The work units reported by each FSS and CS/T which make up this measurement are aircraft contacted, flight plans originated, pilot briefs and flight condition messages. A flight plan may be filed orally or in writing to qualify for inclusion in the activity count shown here.

Table 18

AIRCRAFT CONTACTED
FAA FLIGHT SERVICE STATIONS AND COMBINED STATION/TOWERS

(In millions)

Fiscal Year	Total	IFR-DVFR	VFR	Air Carrier	General Aviation	Military
1962	7.0	1.1	5.9	.6	5.0	1.4
1963	7.4	.9	6.5	.7	5.5	1.2
1964	7.7	.8	6.9	.7	6.0	1.0
1965	8.1	.9	7.2	.7	6.5	.9
1966	8.6	.9	7.7	.7	7.1	.8
1967*	9.3	1.0	8.3	.7	7.9	.7
1968*	10.0	1.1	8.9	.7	8.6	.7
1969*	10.6	1.2	9.4	.7	9.3	.6
1970*	11.4	1.3	10.1	.7	10.1	.6
1971*	12.2	1.4	10.8	.7	10.9	.6
1972*	13.1	1.5	11.6	.7	11.8	.6
1973*	14.0	1.7	12.3	.8	12.7	.5
1977*	18.3	2.5	15.8	.9	16.9	.5

*Forecast.

Note.—Aircraft contacted represent a record of the number of aircraft with which FAA facilities (FSS, CS/T) have established radio communications contact. One count is made for each en route, landing or departing aircraft contacted by a facility, regardless of the number of contacts made with an individual aircraft. A flight involving contacts with five different facilities, disregarding the number of contacts with each, would be counted as five aircraft contacted.